

1. Roll-Call: please sign up on the telecon notes pages

STDT members		Study Office members	
here	Allen, Steve		Gelmis, Gregg
*	Bautz, Mark		King, Mark
On travel	Brandt, Niel	das	Schwartz, Dan
On travel	Bregman, Joel		Schwartz, Eric
On travel	Donahue, Megan	*	Swartz, Doug
	Evans, Dan	ht	Tananbaum, Harvey
	Gaskin, Jessica	here	Weisskopf, Martin
*	Hickox, Ryan	Daniel Castro David Ardila	
ahc	Hornschemeier, Ann		
	Jeltema, Tesla		
	Kollmeier, Juna		
lal	Lopez, Laura		
	Madau, Piero		
brm	McNamara, Brian		
	Nandra, Paul		
On travel	Osten, Rachel		
	Ozel, Feryal		
On travel	Paerels, Frits		
	Parmar, Arvind		
*	Petre, Rob		
	Pivovarovoff, Mike		
*	Pooley, Dave		
gwp	Pratt, Gabriel		
*	Ptak, Andy		
here	Quataert, Eliot		
	Reynolds, Chris		
	Smith, Randall		
*	Stern, Daniel		
x	Tashiro, Makoto		
*	Vikhlinin, Alexey		

2. Science Direction Survey

NOTE: In the spreadsheet, whoever has editor privileges can click:
 Format -> Text Wrapping -> Wrap.
 (Overflow is the default)(das)

A Preliminary Grouping of Science Topics:

Baryons in the Circumgalactic Medium:

- Baryon content

- Effect of Feedback on CGM
- Effect of CGM on Star Formation
- Effect of CGM on fueling the AGN
- Starburst-driven outflows

Supermassive Black Holes:

- Masses and Origins of Seeds
- Growth at high redshift
- Feedback
- Spins
- [Accretion Physics \(e.g. hot v. cold accretion, resolving Bondi radii\) Steve A.](#)

Clusters:

- Cosmology with Clusters
- Turbulence and bulk motion of the ICM ([maybe go with Physics of ICM and evolution of ICM as separate topics? Emphasis on high spatial/spec res. Steve A.](#))
- Enrichment of the ICM

Fundamental Physics:

- Dense Matter Equation of State through neutron star radii and masses
- Black Hole Spacetimes (via iron lines and reverberation)
- Sterile Neutrinos -- Dark Matter

Stellar Physics:

- Atmospheres of Stars
- Transient Mass Loss
- Supernova Remnants: progenitors, explosions, particle acceleration
- Exoplanet studies

X-ray Binaries

- Binaries, including in
- Globular Clusters and at High Redshift,
- ULXs

Time Domain:

- LSST Transient Follow-up
- Quasar Microlensing -- sizes of accretion disks, DM distribution
- X-ray Pulsar Spectroscopy
- QPOs in X-ray binaries
- [\(also reverberation mapping in binaries? - will likely push time res. Down to ~1-10 microseconds? Steve A.\)](#)
- [AGN variability](#)

Energy Band:

0.1--10 keV, except for nonthermal cluster emission

Higher energy capabilities may be required for: iron lines, Compton hump, ULXs (we will inquire how high we can go -- 30 keV? -- and the trade-offs for this would be)

Energy Resolution:

At a first glance, roughly $\frac{1}{3}$ each for

- CMOS/CCD with $\Delta E = 100$ eV
- Gratings with $R \sim 5000$
- Calorimeter with $\Delta E < 20$ eV (cluster physics needs <few eV Steve A.)

Timing Resolution:

Of the order of ~ 1 s, with possible exception of transients that require 0.1 s

A couple of science topics will require much higher (millisecond-10 microsec) resolution

Will study this trade-off

Angular Resolution:

Nearly all respondents indicated need for ~ 0.5 arcsec

In the trade study, explore whether 0.2" is achievable/needed

Sensitivity Limit:

Depending on the science goal, 10^{-16} -- 10^{-19} erg s^{-1} cm^{-2}

As a point of comparison, Chandra's limit is roughly 10^{-17}

Additional discussion items: capability to respond to fast TOO's

"Fast" needs to be quantified. E.g., <2 hrs implies certain reaction wheel capability.

< few hours implies Operations staffing level and accessibility to ground stations.

< ~24 hours implies a high fidelity command generation system requiring no human Review. (das)

3. Meeting schedule

A science-focused F2F meeting in the Fall?

Dates for the Spring '17 science workshop in Washington, DC?

4. Miscellaneous

- Summer telecon schedule

- We may be able to get a presentation / Q&A session from Gary Blackwood (Exoplanet Exploration Program) on the study plan, CML's, procedure for assessing CML's, etc. *Do we want this?* FYI, here is a link to the "original" CML paper, which provides a bit more information than the presentations: [13-3547_A1b.pdf](#)